What is claimed:

1. An activated carbon supported cobalt based catalyst, comprising a substantially high dispersion of at least one of a zirconium component, an cerium component, a ruthenium component or potassium component in a porous carbon matrix and elemental cobalt either deposited thereon or substantially uniformly dispersed therein, wherein the concentration of activated carbon in the catalyst is from 20 to 90 percent by weight, based on the weight of the catalyst, the concentration of elemental cobalt in the catalyst is from 1 to 50 percent by weight, based on the weight of the catalyst, the total concentration of the zirconium component, the cerium component, the ruthenium component, the potassium component, or a combination thereof in the catalyst is from 0.1 to 40 percent by weight, based on the weight of the catalyst and calculated as the elemental metal or metals, and each of the zirconium, cerium, ruthenium or potassium components that is present is in the form of the elemental metal, its oxide or a combination thereof.

2. The catalyst of claim 1, wherein the activated carbon carrier in the catalyst is made from almond core, cocoanut shell, palm tree wood, or coal.

3. The catalyst of claim 1, wherein the activated carbon carrier has surface area in the range of 200-2000 m^2 /g, pore volume of 0.3 to 2.0 ml/g, distribution of pore diameter of 4 to 1000 Å.

4. The catalyst of claim 3, wherein the activated carbon carrier has surface area in the range of 800-1500 m^2 /g, pore volume of 0.35 to 0.75 ml/g, distribution of pore diameter of 5 to 500 Å.

5. The catalyst of claim 1, wherein the concentration of elemental cobalt in the catalyst is from 1 to 40 percent by weights, based on the weight of the catalyst.

6. The catalyst of claim 5, wherein the concentration of elemental cobalt in the catalyst is from 5 to 25 percent by weights, based on the weight of the catalyst.

7. The catalyst of claim 1, wherein the total concentration of the zirconium component, the cerium component, or combination thereof in the catalyst is from 0.1 to 30 percent by weight, based on the weight of the catalyst and calculated as the elemental metal or metals.

8. The catalyst of claim 7, wherein the total concentration of the zirconium component, the cerium component, or combination thereof in the catalyst is from 0.5 to 10 percent by weight, based on the weight of the catalyst and calculated as the elemental metal or metals.

9. The catalyst of claim 1, wherein the total concentration of the potassium component, ruthenium component, or a combination thereof in the catalyst is from 0.01 to 10 percent by weight, based on the weight of the catalyst and calculated as the elemental metal or metals.

10. The catalyst of claim 9, wherein the total concentration of the potassium component, ruthenium component, or a combination thereof in the catalyst is from 0.1 to 1 percent by weight, based on the weight of the catalyst and calculated as the elemental metal or metals.

11. The preparation process of the catalyst of claim 1, comprising:

(1) co-impregnating or stepwise-impregnating the metals from solutions of metals nitrates or carbonates or carbonyls onto the support under vacuated conditions,

(2) drying at room temperature for several days, then at 80 to 90 °C for 8 hours, and finally at 110 to 120°C for 10 hours, and

(3) reducing by a flow of hydrogen at reduction temperature within the range of 100 to 700°C for reduction period within the range of 1 to 50 hours.

12. The process of claim 11, wherein said vacuated conditions may be within down to 80 kPa.

13. The use of the catalyst of claim 1 in the process for directly synthesis of diesel distillates with the paraffins having carbon number less than 25 as principal distillates from synthesis gas through Fischer-Tropsch synthesis.